Introductory Lab Module in Ecology and Evolutionary Biology

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Instructor Office Hours: Wednesdays 10 am - 12 pm
TA Office Hours: Sunday 1 – 5 PM in ABL 125

Course Website: https://owlspace-ccm.rice.edu/portal/site/EBIO-213-Sp16

Course Description:
This is a two credit, half-semester course (beginning after Spring Break) that introduces students to the science of ecology and evolutionary biology through hands-on, inquiry-based laboratory and field exercises. The class meets twice a week: a lecture on Mondays introduces the week's topic; students then attend one of three afternoon lab sections that provide practical experience in the fundamentals of natural history, data collection and analysis, and communication of results.

Course Learning goals:
By the end of the course, you will be expected to know and be able to do the following things:

- **Generate a valid scientific hypothesis** and suggest several feasible ways to test it;
- **Perform basic statistical analyses**, including t-tests and Chi-squared tests;
- **Search for and locate peer-reviewed research articles** and extract meaningful information;
- **Create a scientific report** using appropriate format, terminology, grammar, citations, and figures;
- **Demonstrate competence in basic skills** in ecology and evolutionary biology:
    - Formulate a valid hypothesis and design simple experiments to test it;
    - Survey a population and determine whether its sex ratio deviates from 1:1;
    - Conduct a biological species inventory, quantify the diversity of the samples collected, and assess the results;
    - Distinguish between ecosystems, habitats, and microhabitats and provide examples of each;
    - Identify abiotic and biotic factors that determine a species' geographic range and explain how these contribute to an organisms' fundamental and realized niche;
    - Explain the role of taxonomy in systematics and its importance to the biological sciences;
    - Approximate the number of living species on the planet and their relative distribution across the tree of life;
    - Reconstruct and interpret a phylogenetic tree;
    - Use online databases to search for, interpret, and analyze DNA sequence data.

Location and Time:
Lectures are Mondays from 2-2:50 PM in **Herring 129**. Labs are on Tuesdays, Wednesdays, and Thursdays from 1–5 PM in **Anderson Biology Labs 125**. Due to space constraints, ***students must attend the lab section for which they are officially enrolled***.

Course Schedule:

Week	Date	Topic
Week 1	Mar 7	Lecture: Intro to conducting research in ecology and evolution
	Mar 8, 9, 10	Lab 1: Squirrel behavior (around campus)
Week 2	Mar 14	Lecture: Population biology and basic statistics
	Mar 15, 16, 17	Lab 2: Isopod population biology (around campus)
Week 3	Mar 21	Lecture: Introduction to local ecosystems
	Mar 22, 23, 24	Lab 3: Local ecosystems (Field trip—return by 7 pm)
	Mar 28 – 31	*NO CLASS (SPRING RECESS)*
Week 4	Apr 4	Lecture: Measuring biological diversity
	Apr 5, 6, 7	Lab 4: Biodiversity of leaflitter organisms (in lab)
Week 5	Apr 11	Lecture: Taxonomy and systematics
	Apr 12, 13, 14	Lab 5: Reconstructing evolutionary history (in lab)
Week 6	Apr 18	Lecture: Molecular evolutionary genetics
	Apr 19, 20, 21	Lab 6: The Tree of Life and molecular sequence data (in lab)

Requirements:
Students are required to attend all labs. Students must attend the lab section for which they are registered (unless they are ill, in which case they must contact Dr. Solomon ***before*** their scheduled class). Course announcements will be posted on Owl-Space and sent to each students' Rice email addresses, so students are responsible for regularly checking both the course Owl-Space site and their email accounts.

Field Trip:
The third lab (week of March 21-24) will take place off campus. Transportation will be provided and will leave from campus. Because of the travel time (about an hour each way) we return to campus by 7 pm. ***Students must be prepared to get dirty and wet***; recommended clothing includes long pants, boots or old tennis shoes, a hat, sunscreen, insect repellant, a raincoat or poncho. Students are also advised to bring water and a snack. More details will be provided in the pre-lab lecture on March 21.

Lab reports:
For each lab, students will complete an exercise during the scheduled class time (note that these hours will be extended for the field trip during lab 3). ***Lab reports will be submitted electronically and will be due by Monday at noon the week following each lab.*** Reports submitted after the deadline will be penalized 5 points per 24 hours late.

Honor Code:
Quizzes are open notes, closed-book and closed-internet. Students are expected to work in groups during in-class laboratory exercises, but all laboratory reports should be completed individually. Any sources used to complete a lab report, including materials provided as part of the class (i.e. lectures and readings posted on Owl-Space), must be properly cited.

Note:
If you have a disability that will impact your coursework, please speak with Dr. Solomon during the first two weeks of class. All discussions remain confidential. Additionally, you must contact Disability Support Services (http://dss.rice.edu/) located in the Allen Center, Room 111.

Grading:
Grades for this course are based on quizzes taken on Owl-Space following each lecture and lab write-ups due at the start of lab the following week. The course is graded on a straight scale, with the following cutoffs for final grades (98-100% = A+; 93-97 = A; 90-92 = A-; 88-89 = B+; 83-87 =B; 80-82 = B-; 78-79 = C+; 73-77 = C; 70-72 = C-; 68-69 = D+; 63-67 = D; 60-62 = D-; < 60% = F) and points assigned as follows:

Assignment	Points / Assignment	Number	Subtotal	% of final grade
Lab reports 1, 5, 6	30	3	90	30%
Lab reports 2, 3, 4	50	3	150	50%
Quizzes	10	6	60	20%
Total			300	100%

Required readings listed by week:
All readings are available as pdfs on Owl-Space

Week 1
Lee, Jeffrey A. (2000) *The Scientific Endeavor: A Primer on Scientific Principles and Practice* Addison Wesley Longman, Inc.
Chapter 3 "Research" pp. 27 – 55

Pianka, Eric R. (2000) *Evolutionary Ecology*, 6th ed. Addison Wesley Longman, Inc.
Chapter 1 "Background" pp. 1 – 15

Rudgers, Jennifer *Guidelines for Writing Scientific Papers* unpublished.

Week 2
Kingsolver, Robert (2006) *Ecology on Campus* Benjamin Cummings.
Chapter 1 "Describing a Population" pp. 1 – 10

Motulsky, Harvey (2010) *Intuitive Biostatistics: A Nonmathematical Guide to Statistical Thinking* Oxford University Press.
Chapter 1 " Statistics and Probability Are Not Intuitive" pp. 3 - 13
Chapter 2 "Why Statistics Can Be Hard to Learn" pp. 14 – 16
Chapter 3 "From Sample to Population" pp. 17 – 22
Chapter 15 "Introducing P Values" pp. 111 – 121
Chapter 16 " Statistical Significance and Hypothesis Testing" pp. 122 – 129

Week 3
Kingsolver, Robert (2006) *Ecology on Campus* Benjamin Cummings.
Chapter 8 "The Niche" pp. 177 – 198
Chapter 15 "Soils" pp. 337 - 360

Week 4
Kingsolver, Robert (2006) *Ecology on Campus* Benjamin Cummings.
Chapter 13 "Biodiversity" pp. 299 – 318

Johnson, Elizabeth A. and Catley, Kefyn M. (2002) *Life in the Leaflitter* The American Museum of Natural History, 17 pp.

Week 5

Wilson, Edward O. (1999) *The Diversity of Life* W. W. Norton & Co.
Chapter 4 "The Fundamental Unit" pp. 35 – 50

Baum, David (2008) Reading a phylogenetic tree: The meaning of monophyletic groups. *Nature Education* 1(1).

Week 6

Agostino, M. (2012). *Practical bioinformatics*. Garland Science.
Chapter 1 "Introduction to Bioinformatics and Sequence Analysis"